

**IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE**

TITLE:

BALLPOINT PEN TYPE INPUT DEVICE FOR COMPUTER

INVENTOR:

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[0001] This patent application is a continuation of and claims priority on a co-pending utility application entitled "Ballpoint Pen Type Input Device for Computer", Serial No. 09/225,050, having a filing date of January 4, 1999, and an anticipated issue date of October 14, 2003.

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FIELD OF THE INVENTION

[0002] The subject invention is generally related to an input device for entering manually created alphanumeric and graphic data into a computer and is specifically directed to a pen type input device.

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BACKGROUND OF THE INVENTION

[0003] Means for entering input into a computer system are well-known. Early computers used punched tape and punched cards to provide input to the central processing unit of the computer system. Later systems incorporated digital magnetic tape, floppy discs and other media capable of holding large amounts of data. As computers have become more user friendly, keyboards, compact disc read only memory units (CD ROMS), mouse devices and other input systems are routinely incorporated in a typical personal computer system. Voice activation systems have also been developed allowing limited audio input to be entered, whereby the computer system responds by talking to it.

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[0004] Peripheral input devices are also available such as modems for receiving digitized data from any of a variety of remote sources and entering the information into the computer.

[0005] One of the major drawbacks to the ready utilization of computers by a large segment of the population is that the primary input device has become a typical typewriter keyboard. While this is very versatile and useful, it has certain drawbacks to those individuals who are not skilled typists. Hence, the voice activated systems, mouse systems and other input devices have been developed to provide more acceptable input options to those individuals who are threatened by the use of a keyboard. Many of these devices have become so well accepted that they are routinely used in connection with the standard keyboard input device to enhance the use of the computer by even the most skilled users.

[0006] With all of these devices available, one significant use of the computer and a suitable input device has been ignored. Specifically, there are no input devices, which permit the computer to directly receive data, which is manually scripted, whether it is graphic or alphanumeric in nature.

[0007] While it is true that certain devices such as stylus probes in combination with touch screen technology permit a user to manually input information on a screen, available in such devices as, by way of example, PaimPilot systems and the like, these devices are very limited and are not responsive to typical script input. For example, if a user wanted to input the data stored in a manually created inventor's note book, at the present time this would be accomplished either by recreating the data at a keyboard or by scanning the data into the system through a scanning device. Other stylus technology uses a grid or other technique to determine where the "pen" is relative to the paper or other medium.

[0008] At present there are no devices for permitting the direct input of manually scripted or created graphic and alphanumeric data into a computer system.

SUMMARY OF THE INVENTION

[0009] The subject invention is directed to a wireless pen-type input device that in its outward appearance resembles a standard ballpoint pen. In its preferred form the pen operates as both a standard ballpoint pen or similar writing instrument as well as an input device to the computer. The pen includes sensors for determining the direction and length of each pen stroke as well as the position of the pen on the paper. A transmitter is provided in the pen barrel for transmitting the stroke signals directly to the computer for input and processing each stroke to provide an accurate representation of the pen stroke as it is being made. In the preferred embodiment, the transmitter is a wireless device for transmitting radio signals to a receiver associated with the computer. This permits the pen to be utilized anywhere within the transmitting range of the device, and in any orientation, with the computer picking up, processing and storing the signal. The pen may also be a wired device where desired, which while making the device less versatile, may permit the incorporation of less expensive devices while preserving general versatility.

[0010] The sensor system breaks the stroke signal into typical “x” and “y” coordinates, the “z” axis monitoring pressure so that the thickness and boldness of the stroke is preserved and “start and stop”, i.e., contact with the paper during a stroke, is monitored. Both the orientation of the stylus and the direction of the stroke may be monitored, allowing for non-symmetric shaped tips, permitting bold and thin strokes to be made such as, by way of example, in calligraphy style writing or in more sophisticated graphic representations.

[0011] In one embodiment, a video type sensor system is used, where the pen processing unit actually “looks” at where the pen is relative to an origin point on the paper or other

media, both with respect to orientation and position. In another embodiment, the pen defines the point of origin based on first signal and motion sensors are used to define pen movements and orientation from the defined point of origin.

5 [0012] In the wireless unit, a self-contained power supply is provided, permitting the pen to be fully portable. In the preferred embodiment, the pen resembles a typical ballpoint pen and may include a pocket clip, where desired.

[0013] The pen of the subject invention permits scripted or manually created data to be put directly into a computer system. For example, it permits accurate input of a signature for original documents and the like, as well as general text and graphic information. As an
10 example of possible uses, the pen of the invention would permit remote signature of legal documents, with an accurate facsimile of a signature being affixed to a document on a near real time basis with the act of actual signature on a physical document anywhere in the world. This would greatly facilitate the completion of legal transactions involving parties who are separated by distance.

15 [0014] Other uses are the storage of manually created data for archive and retrieval purposes in its original format. For example, notes kept in an inventor's notebook can be input into a computer system in the inventor's handwriting, further authenticating the electronically stored version of the information.

[0015] One of the most desirable uses of the pen is to permit unlimited alphanumeric and
20 graphic input into a computer utilizing a manual input device, eliminating the need to recreate information on a keyboard or scanning the information into the system from hard copy.

[0016] It is, therefore, an object and feature of the subject invention to provide a manual input device for inputting manually created alphanumeric and graphic data directly into a computer.

[0017] It is a further object and feature of the subject invention to provide a device for
5 transmitting manually generated pen strokes into a computer system simultaneously with the origination of the stroke by a user.

[0018] It is another object and feature of the subject invention to permit the use of a standard ballpoint pen as a computer input device.

[0019] It is also an object and feature of the subject invention to provide a portable, wireless
10 input device for inputting manual pen strokes into a computer system, without restricting the position of the pen relative to the computer.

[0020] It is yet another object and feature of the subject invention to provide a device for capturing the accurate and distinctive style of a manually scripted input and introducing the input to a computer on a near real time basis.

[0021] Other objects and features of the invention will be readily apparent from the
15 accompanying drawings and detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing; it being understood that the drawings contained herein are not necessarily drawn to scale; wherein:

[0023] Fig. 1 is a longitudinal, cutaway view of a ballpoint pen housing adapted for carrying the pen/input device of the subject invention.

10 [0024] Fig. 2 is a graphic illustration of pen strokes and the transmission thereof to the computer via the sensors and transmitter system of the pen/input device of Fig. 1.

[0025] Fig. 3 is a diagrammatic view of a motion sensor system for use in combination with the pen/input device of the subject invention.

15 [0026] Fig. 4 is a diagrammatic view of a “mouse” type motion sensor system for use in combination with the pen/input device of the subject invention.

[0027] Fig. 5 is a top view looking down on the motion sensor system of Fig. 4, showing the “z” axis sensor.

[0028] Fig. 6 is an alternative sensor system utilizing a deflection sensor configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0029] As shown in a cutaway, longitudinal view, a typical ballpoint pen housing (10) is adapted for housing the pen/input device of the subject invention. The pen barrel (12) houses the pen/input device of the subject invention, as will be described. A removable cap (14) is adapted for housing an independent power supply such as a dry cell battery unit (18). Where desired, the cap or barrel may also include a standard pocket clip (16). Other power supplies, such as, by way of example, a rechargeable system or a solar cell could also be used. The pen/input device includes a typical ballpoint pen cartridge with a rolling ball pen “point” (22). Sensors (24 and 28) are housed in the barrel (12) for monitoring the movement of the ball (22). Wires (26 and 30) are connected to sensors (24 and 28, respectively), for carrying the sensed motion signals to a transmitter (32) which transmits the motion signals to a remote receiver via a low frequency radio signal through integrated antenna (34). The transmitter/sensor system is connected to the internal power supply (18) via a coupling system such as, by way of example, the wires (36, 38). The power supply connectors can be any of the well-known contact system standard and known to those who are skilled in the art. For example, a standard flashlight connector system can be readily adapted to the present invention.

[0030] In the embodiment of Fig. 1, where video sensors (24 and 28) are utilized, the tip of the barrel (12) includes a transparent window (40) through which the sensors (24 and 28) can monitor the movements of the ball and the orientation of the pen relative to the transfer media, such as paper, not shown. This assures that the position of the pen relative to the paper is known both during a pen stroke and when the pen is lifted and moved to another

portion of the paper. As best shown in Fig. 2, all motions of the pen can be defined by standard “x” and “y” coordinates. This permits any alphanumeric or graphic data to be defined by a point-to-point “x” and “y” position of the ball (22) to the paper or other media. By monitoring the position of the ball relative of a defined origin point, the “x” and “y” position data can be transmitted via the transmitter (32) to a remote computer and accurately reproduced in electronic form.

[0031] In the embodiment shown in Fig. 2, the video sensors (24 and 28) “watch” and transmit the pen movements relative to the paper. For example, the sensor (28) monitors the orientation (rotation) of the pen relative to the origin and the sensor (24) monitors the angle and distance of the pen relative to the origin in order to define the “x” and “y” coordinate of each point representing the alphanumeric or graphic input. By using an orientation sensor, the style of stroke may be monitored as well as the “x” and “y” position. Thus, if a calligraphic (flat) point were used instead of the ball, both the “thin” and “thick” line strokes can be monitored by sensing the orientation (rotation) of the point about the center axis of the pen.

[0032] An alternative sensor system is shown in Fig. 3. As there shown, a stiff wire unit (50) is housed within the cartridge (20) and is located along the central axis of the pen. A friction contact surface (52) is positioned above and in contact with the ball (22), with sufficient clearance to permit ink to flow around the surface (52) and onto the ball. Sensors (54 and 56) are positioned around the perimeter of the wire (50) and monitor deflection of the wire to determine movement of the ball in an “x” and “y” coordinate system. Sensor (58) monitors surface speed of the ball (22) to determine actual coordinate position at any point during a stroke, via the positive contact system as indicated by contact surface (60). This

permits accurate representation of the pen position by combining the “x” and “y” deflection with the speed of movement. The sensor (58) may also monitor ball pressure (or “z” axis deflection) in order to capture the boldness of the stroke.

[0033] A sensor system based on the mouse principal is shown in Figs. 4 and 5. This system
5 utilizes sensors that are in direct contact with the rolling ball (22). In this configuration, the “x” sensor is a pressure or deflection sensor having a positive contact surface (61) and a diametrically opposite negative contact surface (60). The sensor monitors the deflection of the ball in the “x” direction. The “y” sensor (62) operates in a similar manner with the positive contact (63) and the negative contact (62) measuring pressure or deflection in the
10 “y” direction. The actual deflection is monitored on a calibrated index or reference system (65) provided in each sensor (60 and 62) and the resulting vectors give accurate “x,” “y” directional coordinates for the pen motion.

[0034] The speed sensor (70) is shown in Fig 5 and may be positioned anywhere on the ball (22). Preferably the speed sensor will be positioned on the central axis of the ball (22) so
15 that it can also be used as a pressure (“z” axis deflection) sensor, to indicate boldness of stroke. The ball (72) provided in the sensor (70) monitors surface speed of the ball (22) and when combined with the deflection signals of sensors (60 and 62) provides an accurate signal representing direction and length of each pen stroke. In the preferred embodiment, the origin point of the pen is the first point input and all additional strokes are measured from that
20 point. Other origin or orientation points may be defined in the well-known manner.

[0035] Fig. 6 is an embodiment incorporating the same principals as the embodiment of Figs. 4 and 5, with a modified sensor construction. As in Fig. 5, the “x” sensor (80)

measures “x” deflection of the contact surface (88), the “y” sensor (82) measures “y” deflection of the contact surface (88) and the “z” sensor monitors both speed and pressure.

[0036] The subject invention provides a useful, portable device for inputting manually generated data into a computer system. Where desired the wireless transmitter could be
5 replaced with a hardwired transmitting system to reduce costs. While certain features and embodiments of invention have been described in detail herein, it will be understood that the invention includes all modifications and enhancements within the scope and spirit of the following claims.